Survey and Long-term Monitoring of Small Mammal Populations on the Walnut Creek National Wildlife Refuge Prairie City, Iowa

A Proposal Submitted to the

Walnut Creek National Wildlife Refuge

Research Advisory Committee

Abstract: I propose a study of small mammals on the Walnut Creek National Wildlife Refuge. There will be two components to this study. The first, conducted during the Summer of 1994, will be an intensive survey of small mammal diversity. It will be as comprehensive as possible, and include all major habitats and a variety of trapping methods. The second component will be a long-term, semiannual live-trapping study conducted during Spring and Fall, at times of low and high abundance. It will concentrate on the dominant small mammal species, and will be coordinated with vegetation sampling. This study offers the unique opportunity to obtain base-line data on small mammal populations on the Refuge, and then track changes with restoration of the natural prairie vegetation. This will provide basic data on the ecology of small mammals in restored prairies, and also allow Refuge staff to make informed decisions on the management of small mammal species.

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Project dates: June 1994 - May 1995

Total funding requested: $4690.00

Objectives

I propose to study the distribution and habitat associations of small mammals on the Walnut Creek National Wildlife Refuge, and then track changes in these populations over time. There is presently a unique opportunity to collect base-line data on the small mammals present on the Refuge at the start of the restoration of natural prairie vegetation. There is also the opportunity to track the changes in small mammal communities that accompany restoration of the natural prairie vegetation from the very beginning of the restoration.

These dual objectives will require different approaches, and I therefore propose a study with two components. The first will be a one-time intensive survey of small mammal diversity on the Refuge. Its goal will be to find out what small mammal species are present on the Refuge as of the summer of 1994. Refuge staff may decide it is desirable to repeat this type of intensive survey at regular intervals (for example, every 5 or 10 years).

The second component will be a long-term monitoring of small mammal populations on the refuge. This will attempt to track changes in small mammal communities that accompany the changes in vegetation as restoration of the natural prairie flora proceeds. The mammal surveys will be coordinated with studies of vegetation and physical characteristics of the Refuge, and it may be desirable to use the same study plots for all these investigations.

I will establish a sampling protocol for this long-term monitoring, and conduct the first two samplings (Fall 1994 and Spring 1995). This protocol will be as simple as possible, and require a minimal time investment. This will increase the likelihood of it being continued in the future, whether by myself, Refuge personnel, or other investigators.

Methods

Survey procedures for the two components of the study differ significantly, and are described separately.

Intensive Survey of Small Mammal Diversity

The goal of this portion of the study is to identify the small mammal species present on the Refuge and the habitats they are found in. I will survey all major habitat types on the refuge.

Trapping localities will be identified in June, 1994, before trapping commences. In consultation with Refuge staff, major habitat types will be identified, and sample plots selected. These will include grassland areas, woodlands of various ages, farm fields, savannahs, and several types of wetlands. A minimum of 10 sampling areas will be chosen.

Numerous studies have established that trap type is a significant variable when sampling small mammal populations: different species are most effectively caught by different trap types (Cockrum, 1947; Sealander and James, 1958; Wiener and Smith, 1972). In particular, shrews tend to avoid both live traps and snap traps, but are often captured in pitfall traps (Pucek, 1969; Williams and Braun, 1983; personal experience). I will employ a variety of trapping methods in an attempt to capture all species present. Sherman live traps, Museum Special snap traps, and pitfall arrays will be used for small rodents and insectivores, and Havahart traps for squirrels and weasels.

Each of the sampling areas will be trapped four times over the course of the study. Each time this trapping will include separate lines of 40 Museum Special snap traps and 40 Sherman live traps, plus 10 Havahart live traps for squirrels and weasels. Traps will be baited with standard small mammal baits (apple, oats, and peanut butter).

They will be set in late afternoon, and checked and pulled the following morning. This will result in 360 total trap nights for each of the 10 sampling areas.

In addition to the trapping plots, pitfall arrays will be established in each major habitat type. These arrays consist of plastic buckets sunk flush with the ground surface. A series of pitfall buckets is then connected by a drift fence of aluminum flashing, which directs small mammals into the traps. Where time and terrain permit, the standard protocol for pitfall sampling proposed by Kirkland et al. (1990) will be followed. This will allow direct comparison with pitfall trapping studies in other geographic regions.

The bat fauna of the Refuge has been studied fairly intensively (J.B. Bowles, personal communication). However, to extend this previous work and complement the study of terrestrial small mammals, I will run mist nets for bats at each of the established study areas for a minimum of two nights.

Long-term Monitoring of Small Mammal Populations

The goal of this component of the study is to provide information on changes in the small mammal communities of the Refuge over time, particularly with respect to changes in vegetation. Sampling will be done in conjunction with other studies of the Refuge, and it may be desirable to use the same study plots for all these investigations.

A total of six to ten study plots will be trapped. These will be in the form of two replicates each for three to five different habitat types. Selection of the study plots will be made after consultation with Refuge personnel so that the areas can be coordinated with those used for other studies.

Trapping procedures for the long-term monitoring will be similar to those used in studies of small mammals on the Konza Prairie Research Natural Area, Kansas

(D.W. Kaufman, personal communication to J.B. Bowles). This will allow ready comparison with the extensive studies of small mammals on the Konza Prairie, Kansas (e.g. Peterson et al., 1985; Clark et al., 1987; Clark et al., 1988).

Two permanent census lines will be established on each census plot. Trapping will be conducted over an eight-day period each Spring and Fall. The two lines will be run consecutively: during the first four days, one census line will be run, and during the last four days traps the second line will be run.

During the trapping intervals, 2 Sherman live traps (Model LFATDG) will be set at each of 20 stations along the census line. Traps will be baited with standard small mammal baits (apple, oats, and peanut butter). They will be set in late afternoon, and checked and pulled the following morning.

In order to minimize disturbance to the study plots only live traps will be used, and captured animals will be released. Before release, the captures will be temporarily marked by clipping a patch of hair from the shoulder or rump; this will allow identification of animals recaptured later in the interval.

Voucher Specimens

During both components of this project, specimens found dead in the traps will be saved and preserved as voucher specimens (study skins and skeletons). At the completion of the study, these specimens will be deposited in the mammal collection of the Iowa Museum of Natural History, University of Iowa, Iowa City. The director of the museum, George Schrimper, has agreed to accept these specimens. These specimens will provide a permanent record of the species found on the Refuge at the time of the study. They will also provide a valuable resource for future studies of the mammals of Iowa.

Project Results

Final reports will be submitted for each portion of the study; submission dates are listed in the accompanying timetable. These reports will detail the exact location of the study areas, and include a copy of the appropriate U.S.G.S. topographic map with the study area clearly marked. The reports will also provide a summary of the study, including methods employed, dates and sampling intensity, and a list of captures and final specimen disposition. I will also make recommendations for further work if appropriate.

Equipment, Supplies, and Stipends

Sherman traps and Museum Special traps are available from the Department of Biology at Central College, as are plastic buckets for the pitfall arrays. I will purchase aluminum flashing for the drift fences. Havahart traps for monitoring squirrels and weasels will also be purchased. Mist nets and associated equipment for bat surveys are available from the Department of Biology at Central College.

A Central College van will be used to transport equipment and study personnel. This van is available from the college for a mileage charge, which is included in the budget. In addition, I am requesting funds for miscellaneous supplies. These will include Rite-in-the-Rain field notebooks, plastic flagging, and peanut butter and oats for bait.

Funds are also requested for summer stipends. I will hire two field assistants to help with the project. They will each receive a stipend of $1000.00, based on an hourly rate of $5.00 per hour for an estimated 200 hours. I have already discussed the

project with a number of Central College Biology students, and should have no trouble filling these positions. As the principal investigator, I will take full responsibility for ensuring that the project is completed in a professional manner. I am requesting a stipend of $1500.00.

Value to Walnut Creek National Wildlife Refuge

Small mammals are an important component of grassland ecosystems, but to date there have been no long-term studies of prairie mammals in Iowa (John Bowles, personal communication). There is also little published information on the changes that occur in small mammal communities during the change from a farm crop to grassland. Therefore, this study will provide basic data on the ecology of small mammals in restored prairies.

Information on the small mammal species present on the Refuge, and their habitat preferences, may help Refuge personnel in making management decisions and establishing priorities for Refuge activities. For example, the bat survey component of the study may provide information useful to a concurrent study of the Federally-endangered Indiana bat. Several other small mammal species (e.g. the southern bog lemming, *Synaptomys cooperi*, the woodland vole, *Microtus pinetorum*, and the prairie vole, *Microtus ochrogaster*) are presently considered to be endangered or in decline in Iowa (Bowles, 1981). Discovery of populations of these species might provide information useful in long-term planning for the Refuge.

Timetable

1 - 30 June 1994	identify study areas for diversity sampling
1 - 31 July 1994	intensive trapping to sample diversity
1 - 7 August 1994	prepare voucher specimens, compile data
15 - 30 September 1994	select long-term sampling plots in consultation with Refuge staff
1 October 1994	submit final report on 1994 Intensive Survey
15 - 30 October 1994	Fall live trapping on study plots
1 - 7 April 1995	Spring live trapping on study plots
1 June 1995	submit final report for 1994-1995 Long-term Monitoring

Budget

Stipend - Principal Investigator (Summer & Fall 1994, Spring 1995)	$1500.00
Stipend - Field Assistants (Summer 1994) 2 @ 1000.00	$2000.00
Havahart traps (weasel and squirrel) - 20 @ $20.00	400.00
Miscellaneous Supplies (field notebooks, flagging, bait)	50.00
Aluminum flashing for drift fences (10" X 500')	200.00
Mileage - 60 mi/day X 30 days X 0.30/mi	540.00
Total	$4690.00

Literature Cited

Bowles, John B. 1981. Iowa's mammal fauna: an era of decline. Proceedings of the Iowa Academy of Science, 88:38-42.

Clark, Bryon K., Donald W. Kaufman, Glennis A. Kaufman, and Elmer J. Finck. 1987. Use of tallgrass prairie by *Peromyscus leucopus*. Journal of Mammalogy, 68:158-160.

Clark, Bryon K., Donald W. Kaufman, Glennis A. Kaufman, Elmer J. Finck, and Schelle S. Hand. 1988. Long-distance movements by *Reithrodontomys megalotis* in tallgrass prairie. American Midland Naturalist, 120:276-281.

Cockrum, E. Lendell. 1947. Effectiveness of live traps versus snap traps. Journal of Mammalogy, 28:186.

Kirkland, Gordon L., Patricia M. Krim, and Chris A. Klinedinst. 1990. Proposed standard protocol for pitfall sampling of small mammals. (unpublished manuscript)

Peterson, Sharon K., Glennis A. Kaufman, and Donald W. Kaufman. 1985. Habitat selection by small mammals of the tall-grass prairie: experimental patch choice. Prairie Naturalist, 17:65-70.

Pucek, Zdzislaw K. 1969. Trap response and estimation of numbers of shrews in removal catches. Acta Theriologica, 14:403-426.

Sealander, John A., and Douglas James. 1958. Relative efficiency of different small mammal traps. Journal of Mammalogy, 39:215-223.

Wiener, James G., and Michael H. Smith. 1972. Relative efficiencies of four small mammal traps. Journal of Mammalogy, 53:868-873.

Williams, Daniel F., and Suzanne E. Braun. 1983. Comparison of pitfall and conventional traps for sampling small mammal populations. Journal of Wildlife Management, 47:841-845.

Curriculum Vitae

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Birth date:

19 October 1957

Education:

University of Massachusetts, Amherst. Doctor of Philosophy in Zoology. Dissertation: Comparative myology of North American moles, with comments on the phylogeny of the Talpidae. Major advisor: David J. Klingener. 1994 (expected).

University of Florida, Gainesville. Master of Science in Zoology. Thesis: An electrophoretic examination of the genus *Pseudobranchus*. Major advisor: Michael M. Miyamoto. 1989.

University of Vermont, Burlington. Master of Science in Botany. Non-thesis Field Naturalist Option. Major advisor: Hubert Vogelmann. 1987.

Hobart College, Geneva, NY. Bachelor of Science. Biology Major. 1981.

Cornell University, Ithaca, NY. Shoals Marine Laboratory. Field Marine Science. Summer 1980.

Research Experience:

Field Assistant, Department of Zoology, University of Massachusetts, Amherst. Recorded bird songs, mist-netted and banded birds, determined nest site characteristics. Donald E. Kroodsma, supervising professor. Summers 1990, 1991, 1993.

Research Assistant, Department of Zoology, University of Florida, Gainesville. Established and supervised laboratory for allozyme electrophoresis and population genetics of *Cercyonis* butterflies. Thomas C. Emmel, supervising professor. 1989.

Lab Technician, Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg. Analysis of mercury content of aquatic organisms; collected fish and aquatic invertebrates, maintained laboratory, analyzed data. Albert C. Hendricks, supervising professor. 1986 - 1987.

Field Assistant, Biological Survey of Haitian National Parks. A project of the Florida State Museum, University of Florida, Gainesville. Mist-netted birds and bats, trapped small mammals, collected reptiles and amphibians. Charles A. Woods, supervising professor. 1985.

College and University Teaching Experience:

As a Lecturer: Comparative Vertebrate Anatomy, Environmental Studies, Diversity of Life, Evolution.

As a Lab Instructor: Comparative Vertebrate Anatomy, Mammalogy, Vertebrate Zoology, Animal Physiology, Introductory Biology.

Other Work Experience:

Berkshire Country Day School, Lenox, MA. Fifth and sixth grade environmental science teacher, seventh grade biology teacher. Established Environmental Science Laboratory. Homeroom teacher, sports coach. 1981 - 1984.

Massachusetts Audubon Society, Berkshire Sanctuaries, Lenox, MA. Natural history programs and publications, care of captive animals, supervision of trail maintenance and construction. Paid and volunteer positions, 1976 - 1979.

Research Grants:

Population fluctuations and habitat preferences of small mammals in Iowa. 1993. Faculty Research and Development Grant, Central College, Pella, IA. $1100

Comparative morphology and systematics of Old World moles (Talpidae). 1992. Collection Study Grant, American Museum of Natural History, New York, NY. $200

Head and neck muscles of North American moles. 1991. Theodore Roosevelt Grant, American Museum of Natural History, New York, NY. $300

Survey for Southern Bog Lemming. 1991. Massachusetts Natural Heritage and Endangered Species Program, Boston, MA. $900

Papers Presented at Scientific Meetings:

The head and neck muscles of North American moles. 1991. American Society of Zoologists, Division of Vertebrate Morphology, New England Regional Meeting.

Publications:

Myocastor coypus. 1992. Mammalian Species, 398:1-8, 3 fig. American Society of Mammalogists. C.A. Woods, L. Contreras, G. Willner-Chapman, and H.P. Whidden.

The shoulder anatomy of the Asiatic Shrew Mole, genus *Uropsilus*. 1992. American Zoologist, 32(5). (Abstract).

An electrophoretic study of the dwarf siren salamander, *Pseudobranchus striatus*. In manuscript (co-author).

Service as Reviewer:

Transactions of the Northeast Section of the Wildlife Society. 1991.

Service in the Department of Zoology, University of Massachusetts:

Systematics Discussion Group. Chairman. 1991-92.

Colloquium Committee. Graduate Student Member. 1991-92.

Graduate Student Seminar Series. Co-chairman. 1990-91.

Professional Societies and Year Joined:

American Society of Mammalogists. 1988.

Society of Systematic Biologists. 1988.

Society for the Study of Evolution. 1990.

American Society of Zoologists. 1992.

Society for the Study of Mammalian Evolution. 1993.

Summary of Dissertation:

My doctoral dissertation describes the myology of the five genera of North American moles, and provides a systematic analysis of the Family Talpidae based on morphological characters. Techniques used include gross dissection of muscles, comparative osteology, and clearing and staining of specimens for bone and cartilage. Data are analyzed using PAUP, a computer program for cladistic phylogenetic analysis. I use my systematic analysis to test hypotheses about the evolution of specializations for burrowing, and also hypotheses of the biogeographic history of North American talpids. The study indicates the importance of future work on Asian moles, particularly the Asiatic Shrew Mole (*Uropsilus*), generally considered the most primitive living mole.

Future Research Plans:

Continue descriptive myology and osteology to explore phylogenetic relationships of moles, incorporating Asian taxa.

Ecology and distribution of the mammals of Iowa.

Alpha-level taxonomy and natural history of Chinese moles, shrews, and hedgehogs.